

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 05-688-2262-X

SUBSYSTEM NAME: EPD&C - BRAKE/ANTI SKID

REVISION : 2 03/08/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	FWD LCA 1	MC450-0054-0001
LRU :	FWD LCA 1	MC450-0054-0002
LRU :	FWD LCA 2	MC450-0055-0001
LRU :	FWD LCA 2	MC450-0055-0002
SRU :	CONTROLLER, HYBRID DRIVER	MC477-0261-0002
SRU :	CONTROLLER, HYBRID DRIVER	MC477-0263-0002

PART DATA

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

CONTROLLER, HYBRID DRIVER (HDC), TYPE I & III, MAIN LANDING GEAR NO
WEIGHT-ON-WHEEL CIRCUIT/BRAKE-SKID CONTROL BOXES, A AND B

REFERENCE DESIGNATORS: 81V76A16AR(2)
: 81V76A17AR(2)

QUANTITY OF LIKE ITEMS: 4
TWG PER RELAY INPUT, FOUR PER VEHICLE

■ FUNCTION:

PROVIDES THE CAPABILITY TO MONITOR THE WEIGHT-ON-WHEELS SENSORS AND
PRODUCE A BRAKE INHIBIT SIGNAL VIA RELAYS (K9, K12, K13 FOR BOX A, AND
K11, K16, K17 FOR BOX B) AND INHIBITING BRAKE APPLICATION UNTIL WEIGHT
IS SENSED ON EITHER LEFT OR RIGHT MAIN LANDING GEAR WHEELS. 81V76A16-
AR(2) (MC477-0261-0002), 81V76A17-AR(2) (MC477-0263-0002)

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : EPD&C - BRAKE/ANTI SKID FMEA NO 05-6BB-2262 -1 REV:08/16/88

ASSEMBLY : FWD LCA-1 AND 2	CRIT. FUNC:	1R
P/N RI : MC477-0261-0002, MC477-0263-0002	CRIT. HDW:	2
P/N VENDOR:	VEHICLE	102 103 104
QUANTITY : 4	EFFECTIVITY:	X X X
: TWO PER RELAY INPUT	PHASE(S):	PL LO OO DO X LS
: FOUR PER VEHICLE		

REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS

PREPARED BY:	APPROVED BY:	APPROVED BY (NASA):
DES J HERMAN	DES <u>J. B. Buss</u>	SSM <u>R. Balciunas</u> 9/9/8
REL H YEW	REL <u>H. Yew</u>	REL <u>...</u> 7/8/8
QE W HIGGINS	QE <u>W. Higgins</u>	QE <u>...</u> 9/11/8

EPD&C 256 ... 9/7/8
EPD&C 55M ... 9/4/8

ITEM:
CONTROLLER, HYBRID DRIVER (HDC), TYPE E, MAIN LANDING GEAR NO WEIGHT-ON-WHEELS CIRCUIT/BRAKE-SKID CONTROL BOXES, A AND B.. 81V76A16-AR(2), MC477-0261-0002. 82V76AA17-AR(2), MC477-0263-0002

FUNCTION:
PROVIDES THE CAPABILITY TO MONITOR THE WEIGHT-ON-WHEELS SENSORS AND PRODUCE A BRAKE INHIBIT SIGNAL VIA RELAYS K9, K11 AND INHIBITING BRAKE APPLICATION UNTIL WEIGHT IS SENSED ON EITHER LEFT OR RIGHT MAIN LANDING GEAR WHEELS.

FAILURE MODE:
LOSS OF OUTPUT, OPENS, SHORTS TO GROUND (INDICATES FALSE WEIGHT-ON-WHEELS)

CAUSE(S):
MECHANICAL SHOCK, THERMAL STRESS, VIBRATION, PIECE PART FAILURE, CONTAMINATION, PROCESSING ANOMALY

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE (E) FUNCTIONAL CRITICALITY EFFECT:

(A, B) FIRST FAILURE - LOSS OF SKID AND LOCKED WHEEL PROTECTION ON HALF OF ALL BRAKES.

(C, D) FIRST FAILURE - LOSS OF ANTI-SKID PROTECTION WOULD ENABLE BRAKING PRIOR TO WEIGHT-ON-WHEELS. SECOND FAILURE (UNCOMMANDED BRAKE PRESSURE BEFORE MAIN WHEELS TOUCHDOWN) - POSSIBLE LOSS OF CREW/VEHICLE DUE TO BRAKE/WHEEL/TIRE FAILURE AND UNCONTROLLABLE YAWING FORCE.

FAILS "B" SCREEN BECAUSE HDC FAILURE IS NOT FLIGHT DETECTABLE.

DISPOSITION & RATIONALE:
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE:

(A-D) DISPOSITION AND RATIONALE
REFER TO APPENDIX B, ITEM NO. 1 - HYBRID DRIVER.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :EPD&C - BRAKE/ANTI SKID FMEA NO 05-6BB-2262 -1 REV:08/16/88

(B) GROUND TURNAROUND TEST

VERIFY HYBRID DRIVER OPERATION BY PERFORMING BRAKE/SKID NO WEIGHT-ON-WHEELS BRAKE LOCKOUT TEST AND RIGHT HAND AND LEFT HAND WEIGHT-ON-WHEELS BRAKE/SKID PEDAL TEST. TESTS ARE PERFORMED FOR EVERY FLIGHT AND LRU REPLACEMENT.

(E) OPERATIONAL USE

AFTER SECOND FAILURE WHERE BRAKE PRESSURE IS GREATER THAN 180, TIME PERMITTING, CREW WILL CLOSE HYDRAULIC LANDING GEAR ISOLATION VALVES (SYSTEM 1 AND 3 OR SYSTEM 2 AND 3). THIS ACTION ISOLATES HYDRAULIC PRESSURE FROM THE BRAKES. AFTER NOSE GEAR TOUCHDOWN, SOFTWARE COMMANDS HYDRAULIC ISOLATION VALVE #3 OPEN THEREBY RECOVERING FULL BRAKING FOR ROLLOUT.